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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

DETAILED ACTION

Supplemental Final Action

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 16-19, 21-23 are rejected under 35 U.S.C. 102(b) as being anticipated by WO 98/35739 (hereinafter WO'739). The fluid separator having a composite membrane including one or a plurality of membrane layers (see Fig. 3, Fig. 1, abstract, and page 3, lines 15-28). The membrane substrate is also disclosed (Fig. 1, element 3).

The membrane material, as claimed in claims 17-19 is disclosed by WO '739 as **fluoropolymer** (abstract, column 3, second paragraph). The membrane is further described as permselective capable of separating by diffusion, or non-porous (see page 4, lines 7-23).

The membrane of claims 16-19, although is made from a two coating process steps, as now claimed constitute a single membrane layer on a substrate, for layers made form the same polymer solution on a substrate. As to claim 21, the final product structure is independent of the process of making, and achieving a "seamless boundary" can be obtained by casting the membrane solution in a single step, and increasing polymer concentration to increase the membrane thickness.

This rejection was discussed in paper of 9/18/06 and is maintained for reasons discussed in the response to Applicant's remarks.

3. Claims 16-18 are rejected under 35 U.S.C. 102 as being anticipated by (WO 02/11868). WO'968 teaches a membrane with multiple layers and a first layer on top of a support; the membrane is formed on to a support, and is made of a fluoropolymer, e.g. PTFE (Abstract, fig.1, claims 1-3).

These rejections were discussed in paper of 9/18/06 and are maintained for reasons discussed in the response to Applicant's remarks.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 6-14, 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 98/35739 (hereinafter WO'739) in view of Nemser et al (US 5,051,114), and alternatively in view of Bowser (US 5,116, 650).

WO'739, discussed above teach making a composite membrane made from glassy perfluorodioxole copolymer, and including multiple layers on a substrate (abstract, page 3, lines 3-28). WO'739 further teaches the process of making the composite membrane as known in the art (see page 3, last paragraph bridging page 4, lines 1-6). Details about the drying step between coating steps are disclosed, as in claim 24, e.g. by the

incorporation by reference to the conventional process of applying multiple coatings on a substrate, and temperature conditions as disclosed in Bowser (US 5, 116, 650). WO'739 teaches that when membrane layers thicker than 0.5-6 micron are desired, multiple coating may be applied, which also protect the membrane against pinholes defects (see page 3, lines 26-28).

Nemser et al, incorporated by reference in the WO'739 reference, teaches making membranes on a support and with defect free layer with a thickness higher than 6 microns, e.g. 800-200 microns, the method of making are recognized to be old in the art (abstract, column 4, lines 49-68, column 6, third paragraph). One of the methods disclosed in patent '114 of Nemser et al. teach making the membrane by solvent casting, including the step of dissolving the fluoropolymer in a flurosolvent (see column 8, lines 38-52, column 10, last paragraph, bridging column 11), the later section also teaches treating the cast membrane at temperatures 110 degree c for 12 hours, preparing additional membranes, and heating the membrane at temperature of 150 degree C from longer time, e.g. an additional hour is also disclosed (see example X, column 12). It would have been obvious to one skilled in the art at the time this invention was made to prepare multilayer membrane of the particular fluoropolymer and dry the membrane layers at temperatures within the ranges suggested in '114, to control membrane permeability, as suggested in '114 (see column 13, lines 9-15), e.g. the membrane heating (drying conditions) affect the membrane permeability, and increase in temperature causes an increase in membrane permeability.

As to claim 1, forming multiple layer, or multiple coating is disclosed in 'WO'739, and the drying conditions are disclosed in Nemser et al, as discussed above. Repeating the same process conditions to form multiple layers, e.g to increase membrane thickness it would have been obvious to one skilled in the art at the time this invention was made, based on the suggestions of the WO'739. Furthermore, applying a further coating of the same membrane composition on top of the first membrane layer, which includes the same solvent composition for the "same" polymer, inherently partly dissolves the surface of the first membrane layer, due to solvent diffusion though the first membrane layer creating bonding between the membrane layers.

It would have been obvious to one skilled in the art at the time this invention was made to make the multiple coating membrane as suggested in 'WO 739 by applying successive layers to a first coated membrane made by the process of Nemser ('114), e.g. to increase the membrane thickness, since WO'739 teaches forming the layers by "solvent casting process", as disclosed in the'114 patent. Reference WO'739 teaches that if layers thicker than 0.5-6 micron are required multiple coatings may be applied. Patent '650 is cited as cumulative and showing the drying between coating layers on a substrate in the membrane formation by solvent casting, which reference 'WO 739 also suggest as conventional method of making the membrane that can be used. The '650 reference teaches applying a coating after drying a first coating on a substrate (see examples 1-3). It would have been obvious to apply the concept of using a dried composite support as base for the multilayer membrane or dry the first layer before the application of a subsequent layer(s) in WO'0739 base on its teaching of using the '650

method for making the multilayer non-porous membrane. Selecting a desire thickness for each of the coated layer to produce a final desire final membrane thickness it would have also been obvious to one skilled in this art, e.g. by controlling the coating material viscosity to produce the desire thickness.

As to claims 8, 25-26 partially dissolving a portion of the first membrane layer is not expressly disclosed by the references above, however, by dissolving the polymer in the same solvent, and with the two layer made from the same polymer, one skilled in the art at the time this invention was made can expect a slight dissolution of the first layer e.g. allowing bonding between the layers, and an inherent degree of continuity between the membranes, e.g. seamless boundary.

As to claims 9-10, the fluorosolvent disclosed in Nemser et al ('114) seems to meet the boiling point conditions required.

Regarding claim 12, the drying time is directly related to the membrane thickness, it would have been obvious to one skilled in the art at the time this invention was made to dry a membrane layer having a low thickness at the suggested temperature conditions suggested by Nemser et al, an reduce the membrane drying time to avoid energy lost, or alternatively select the drying and temperature time to provide the final membrane with a desire permeability; selectivity is not affected by the temperature treatment (see '114, column 13, lines 9-16).

As to claims 13 and 14, applicant admits rolling coating as conventional (see specification, paragraph 28). One skilled in the art can expect thinner films formation

with the conventional rolling process. Regarding claim 15, Patent '114 teaches the use of the membrane in oxygen permeation processes ((see table 10).

6. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO 98/35739 (hereinafter WO'739) in view of Nemser et al (US 5,051,114), as applied to claim 6 above, and further in view of Spadaccini et al (US 6709,492) or Staroselski et al (US 7,041,154). WO'739 and patent '114 fail to teach using the membrane in a fuel deoxygenator of an aircraft.

Patent '492 teach using membranes selective to oxygen and made form perfluorinated glassy polymers in aircraft systems (abstract, column 4, lines 6-13).

Patent '154 teaches also teaches using oxygen permeable composite membrane in deoxygenator system of an aircraft (abstract, element 42, column 3, lines 21-49).

It would have been obvious to one skilled in the art at the time this invention was made to use the membrane of WO'739, and /or Nemser et al ('114) to separate gas by diffusion in the oxygenator system of "492 or '154, based on membrane properties and high oxygen permeability and selectivity.

Response to Arguments

7. Applicant's arguments filed 1/18/07 have been fully considered but they are not persuasive. WO'739 teaches making the membrane by conventional "solution casting" (solvent casting) techniques (page 3, lines 15-30 and column 4, lines 1-3), as disclosed in present application disclosure (page 3 last paragraph). Claim 16 and dependent claims are product and not process claims, therefore, whether the multilayer membrane is made with the first membrane layer wet or dried, the final membrane includes a

multilayer membrane. If the membrane in WO'739 is made while the first layer is wet, a "seamless boundary" is formed due to the contact between the layer and the polymer diffusion, so that the layer can be dried as a single thicker layer. Since the solvent diffusion between layers in wet layer is higher, a marking line or seam between layers is not significant or is not present. Regarding claim 6 and dependent claims, the embodiments including multilayer is though to be made by conventional solvent casting, as in reference '5,116, 650, incorporated by reference, which teaches casting the fluoropolymer solution on a dried composite support, as discussed in the 103 rejection above. Alternative embodiments, in which the membrane is alternatively casted on a first coating without drying are also considered in the WO'079 reference (see the incorporation by reference). Nemser teaches the casting and drying conditions required for the dioxoles layer formation, and although one layer is casted in Nemser, reference WO'739 teaches that if layers thicker than 0.5-6 micron are required multiple coatings may be applied. Therefore, the combination of multiple layers of the same polymer casting solution on a support either pre-drying the first layer or not are disclosed in the combination of references.

8. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re*

Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the teaching to provide additional membrane layers to reach a desired thickness either by drying a first layer before coating the second layer, or by successive coating without drying between steps are suggested in WO'739, .g. conventional solvent casting of multilayer coating on a support, see the incorporation by reference of different casting processes. The rejection in the prior Office action is maintained. Bowser is discussed as part of the disclosure of WO739, which incorporates its teaching.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ana M. Fortuna whose telephone number is (571) 272-1141. The examiner can normally be reached on 9:30-6:00 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wanda L. Walker can be reached on (571) 272-1151. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Ana M. Fortuna
Primary Examiner

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01 August, 2007

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